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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/687,112	10/15/2003	Bioh Kim	SEMT116964	7221
26389 7590 10/16/2007 CHRISTENSEN, O'CONNOR, JOHNSON, KINDNESS, PLLC 1420 FIFTH AVENUE SUITE 2800 SEATTLE, WA 98101-2347			EXAMINER TALBOT, BRIAN K	
			ART UNIT 1792	PAPER NUMBER
			MAIL DATE 10/16/2007	DELIVERY MODE PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

**Office Action Summary**

Application No.

10/687,112

Applicant(s)

KIM, BIOH

Examiner

Brian K. Talbot

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 04 September 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-26 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948)                        | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

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1. The amendment filed 9/4/07 has been considered and entered. Claims 27-41 have been canceled. Claims 1-26 remain in the application.
2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
3. In light of the amendment filed 9/4/07, the objection to the specification concerning the Title has been withdrawn. In addition, the 35 USC 112 first and second paragraph rejections have also been withdrawn.

***Claim Rejections - 35 USC § 102***

4. Claims 11-13 and 15-26 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Hur et al. (6,013,572).

Hur et al. (6,013,572) teaches a method of fabricating and testing silver-tin alloy solder bumps. A masked underbump metallurgy layer on a microelectronic substrate defining exposed portions of the underbump metallurgy layer is plated with silver, then plated with tin and then reflowed to form the silver-tin alloy bump (abstract and col. 1, line 55 – col. 2, line 12). The silver and tin layers are applied by electroplating (col. 2, lines 28-42). In another embodiment, two layers of silver and plated followed by a layer of tin and reflowing is performed (col. 2, lines 53-62). The first underbump metallurgy layer is Ti, Cr or TiW. The second underbump metallurgy layer is copper or nickel (col. 2, lines 19-27). The tin layer can comprise an alloy such as silver-tin (col. 3, lines 1-3). The first underbump layer is considered a barrier layer by

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the Examiner as it comprises Cr, Ti or TiW which are conventional barrier/diffusion layers in the art.

***Claim Rejections - 35 USC § 103***

5. Claims 1-10 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over in Hur et al. (6,013,572) combination with Mitchell et al. (5,773,359).

Features described above concerning Hur et al. (6,013,572) are incorporated here.

Hur et al. (6,013,572) fails to teach forming a diffusion barrier layer on the UBM layer underneath the solder material.

Mitchell et al. (5,773,359) teaches an interconnect system and method of fabricating a solder bump is formed on a semiconductor substrate whereby UBM is formed as a tri-layer comprising a bottom barrier layer (26) and two copper layer (27,28). The barrier layer (26) is preferable titanium but other materials can be used including nickel. The barrier layer (26) functions to prevent diffusion of the copper and/or solder layer from penetrating the metal layer (23) on the substrate. In addition, the solder layer (29) comprises tin and lead but the lead can be replaced by bismuth or indium. The solder layer (29) can be applied by electroplating (col. 1, line 48 – col. 3, line 55).

Therefore it would have been obvious for one skilled in the art at the time the invention was made to have modified Hur et al. (6,013,572) solder bump process by incorporating a barrier/diffusion layer above the UBM layer and beneath the solder material as evidenced by Mitchell et al. (5,773,359) with the benefits associated with such a layer as detailed above.

*Response to Amendment*

6. Applicant's arguments filed 9/4/07 have been fully considered but they are not persuasive.

Applicant argued that the Hur et al. (6,013,572) reference is not a 35 USC 102 as it fails to teach a barrier layer.

The Examiner disagrees. While the Examiner acknowledges the fact that the Hur et al. (6,013,572) fails to “explicitly” teach a barrier layer, the Examiner has stated that the first underbump layer is considered a barrier layer by the Examiner as it comprises Cr, Ti or TiW which are conventional barrier/diffusion layers in the art. Hence, a Barrier layer is taught by the reference even though it is not done explicitly.

Applicant argued that the Mitchell et al. (5,773,359) reference fails to teach that the conductive layer does not include material from one of the second conductive layer and the barrier layer.

The Examiner disagrees. The Mitchell et al. (5,773,359) reference is relied upon for teaching a barrier layer on the UBM layer and not for the first or second conductive layers. The first and second conductive layers are taught by the primary reference and do not include material from one of the second layer or barrier as detailed above.

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian K. Talbot whose telephone number is (571) 272-1428. The examiner can normally be reached on Monday-Friday 8AM-4PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy H. Meeks can be reached on (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

*Brian K Talbot* 10/12/07

Brian K Talbot  
Primary Examiner  
Art Unit 1762

BKT